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COVID-19 outbreak: An overview

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Abstract

In present scenario, the Corona virus has become a leading life-threatening disease. The virus has

severely impacted the economy of developing and developed countries to a large extent. In December

2019, the disease outbreak due to novel corona virus SARS-CoV-2 had emerged in the Wuhan city

China, has been spreading worldwide rapidly and World Health Organization (WHO) announced

COVID-19 as an epidemic. Although, some countries have developed vaccines against the virus, still

the second and third wave of disease has emerged. The objective of this review article is to have a

preliminary outlook about the disease, the way of transmission, and diagnosis in the initial stages of

COVID-19.

Keywords: SARS-Co-Virus-2, Corona virus, COVID-19, outbreak.

Introduction

The world is suffering from novel virus that posed serious threat to global health. In December 2019,

Wuhan, Hubei province, China, become the hub of a pandemic of severe pneumonia cases were

reported. First patients were admitted on 12 December, 2019, with symptoms of pneumonia, 27 cases

of viral pneumonia with critical patients, were formally announced on 31, December, 2019 [1, 2].

Gradually, the number of patients began to increase with similar symptoms. Health professionals

were unable to recognize the causative agent; therefore, these initial cases were classified as

"pneumonia of unknown etiology". Centre for Disease Control and Prevention (CDC) centre of

China organized a serious outbreak investigation programme. Thereafter, etiology of this severe

illness is now recognized as a novel virus, belonging to the family of coronavirus (CoV). The virus

was identified and named 2019 novel coronavirus (2019-nCoV). On 11th February, 2020,

Commission of specialists of the International Committee on Taxonomy of Viruses (ICTV) coined it

the SARS-Co-V-2 virus because it is genetic composition was similar to the virus that caused the

SARS outbreak (SARS-Co-Vs). Later on, WHO has changed the name of the virus to Severe Acute

Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) [3]. SARS-Co-V-2 is a novel virus accountable

for an eruption of respiratory disease identified as COVID-19, which has now reached most of the

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countries. In the previous two decades, several pandemics like SARS-Co-V aggravated in China, involving more than 25 nations with 8096 confirmed cases and 800 deaths, in 2002-2003 [4, 5]. In 2009, cases of H1N1 influenza have been reported. In 2012, an outbreak of middle east respiratory syndrome coronavirus (MERS-Co-V), occurred in Saudi Arabia, claiming around 2,500 positive cases and 800 deaths [6].

This novel virus is highly infectious and contagious. Till March 10, 2020, it was spread in 109 countries; there have been 113,702 confirmed cases worldwide and 4,012 deaths have been recorded. Approximately, 71% (80,924) of all coronavirus confirmed cases and 78% (3140) of all death cases related to COVID-19 are from China. After seeing this worst situation, WHO declared China as a "very high risk" province for COVID-19 [7]. On March 11, 2020, WHO officially declared COVID-19 outbreak as a pandemic. Till August 09, 2020, there have been 19,462,112 confirmed cases globally, and 722,285 deaths have been registered [8].

Etiology

Coronaviridae is the family of Coronaviruses (CoV) is Classified into four genera of CoVs, namely; alpha, beta, delta and gamma Coronaviruses. The CoVs genome are RNA viruses consisting of positive-sense, non-segmented, single-stranded RNA with size range between ~27-32 kb, covered by an enveloped structure [9, 10]. The virus is either spherical or pleomorphic as evident in electron microscope. It is characterized by external trimeric spike of glycoprotein on its surface that displays as crown-shape with 80-120 nm in size [11, 12, and 13]. The genomic RNA contains a 5` cap and 3` poly (A) tail and multiple open reading frames (ORFs), allowing it to act as an mRNA for translation of the replicase polyproteins.

Among all the RNA viruses, the RNA genome of CoV is one of the largest [14]. With its high mutation rate, Coronaviruses have become the leading cause of respiratory disease outbreaks. SARS-CoV-2 is the 7th Coronavirus identified to infected humans; SARS-CoV, MERS-CoV and SARS-CoV-2 can cause critical disease, whereas NL63, 229E and OC43 are linked with mild indication [15]. Biochemical and structural studies revealed that the (RBD) Receptor Binding Domain portion of the SARS-CoV-2 spike proteins was so effective at binding to the ACE2 human receptor [16, 17]. Genomic based studies have shown that SARS-Co-V-2 has probably originated from bats and rodents and are the two notable genomic sources of alpha and betaCoVs [18, 19].

Coronavirus Replicating in human body

The cells in the lining of the nose are rich in the cell-surface receptor angiotensin-converting enzyme-2 (ACE-2). ACE-2 receptors are present in ciliated epithelial cells in the lower and upper airway. The

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virus requires this receptor to enter a cell and releases its RNA. The virus RNA uses the host cell to generate new virus RNA and assemble new virions [20].

Four proteins, RdRp, PLpro, and 3CLpro spike are essential for the replication of virus. Therefore, therapeutics targeting one of these proteins is at present being tested as a probable treatment for Covid-19. The spike protein of SARS-Co-V-2 is drastically diverse from SARS-Co-V spike, particularly in two sites when binding to ACE2. Therefore, formerly developed antibodies and remedial peptides for SARS-Co-V spike protein cannot be used for SARS-Co-V-2.

Transmission of Coronavirus

The first confirmed case of the COVID-19 was related to direct contact to the Wuhan Seafood Market, the animal-to-human broadcast was assumed as the main method. Consequently, it was accomplished that virus could also be transmitted from human-to-human. The transmission is supposed to occur through respiratory drop from sneezing and coughing. Currently, it remains indistinguishable whether a person can be infected by COVID-19 by touching an exposed object or surface and then touching their nose, mouth, or maybe eyes [21]. According to data analysis related to the SARS-Co-V-2 spreads in China seems to point out that close contact between individuals is necessary.

Strange history of this novel disease

The clinical history in some patients occurs with particular characteristics. It foresees that the patient has fever, which is not extremely responsive to antipyretics, and a state of depression. A dry cough is regularly associated. After 5-7 days, patients with impaired lung function start to experience shortness of breath and increased respiratory rate. In more delicate patients, however, bronchial crises may appear at the beginning of symptoms. In younger patients and in those who do not have critical respiratory impairments or other comorbidities, dyspnea may appear later. Infected patients experience decline lung injury, there is a decline level of oxygen as well. This seems to be the critical phase of the disease, from this point onwards; there may be rapid impairment of respiratory functions. The situation is truly incredible because for patients who are slightly hypoxic and paucisymptomatic, the first therapeutic approach is oxygen therapy and next is mechanical ventilation. Although this approach is effective, still deterioration of respiratory failure may occur in some patients.

Symptoms and severity spectrum of COVID-19

Patient diagnosed with COVID-19 may be infected from the coronavirus fourteen days before as its incubation period in host is 14 days. Common symptoms of COVID-19 are dry cough, fever,

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tiredness and shortness of breathing. Doctors are also noticed that in some cases, sudden loss of smell and taste are early indications of novel coronavirus infection [22].

Clinical progression-Diagnosis

Before SARS-Co-Virus cases, it was considered that human Co-Virus leads to normal cold, or superior and inferior respiratory infection. In the past years, similar to SARS-Co-V, MERS-Co-V that caused epidemics, first symptoms of illness were commonly distinct as cough, cold, fever, shortness of breath [23]. Early diagnosis of 2019 n-CoV infection is required to manage the disease. Till date, two methods are available for the early and accurate detection of virus.

1. Real Time Reverse Transcription-Polymerase Chain Reaction (RTi-RT-PCR)

Polymerase Chain Reaction has been established as 'gold standard' in the detection of disease-causing pathogens. Various platforms of PCR have been developed for specific and sensitive detection of target pathogen. In organisms where genetic material is RNA, reverse transcription real time PCR is used to detect RNA and quantify the presence of causative pathogen/organism. Real-Time RT-PCR uses different probe chemistries for the quantification of target nucleic acid. The technique offers great sensitivity for diagnosis. By virtue of these RTi-RT-PCR is used for the early (~ 3-4 hours) and sensitive detection of the causative agent of COVID-19, SARS-CoV-2 [25].

2. Lateral flow / Colloidal Gold Immunochromatography

Immunoassays based detection system has been developed for quick detection of SARS-CoV-2. Lateral flow immunoassays are in application for the rapid screening. These assays provide even bedside diagnostics in hospital settings. In particular, SARS-CoV-2 virus or developed antibodies (IgM & IgG) against COVID-19 are detected using this assay. Although, the method is rapid, still there are some disadvantages associated with this. Poor specificity and sensitivity are major challenges of this method [26].

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